

ABSTRACT OF THE DISCLOSURE

A tunneling junction element comprises: a substrate; a lower
conductive layer formed on the substrate; a first oxide layer formed on the lower
conductive layer and having a non-stoichiometric composition; a second oxide
5 layer formed on the first oxide layer and having a stoichiometric composition; and
an upper conductive layer formed on the second oxide layer, wherein the first
oxide layer is oxidized during a process of forming the second oxide layer and has
an oxygen concentration which is lower than an oxygen concentration of the
second oxide layer and lowers with a depth in the first oxide layer, and the first and
10 second oxide layers form a tunneling barrier.